Schaffner Group I Nordstrasse 11 I 4542 Luterbach I Switzerland
P +41 32 681 66 26 I F +41 32 681 66 30 I www.schaffner.com

schaffner
energy efficiency and reliability

Installation Manual

ECOsine® High-Power Line Passive Harmonic Filters

Guideline for open panel filter module installation

FN3410, FN3411 (50 Hz / 200…400kW)

FN3412, FN3413 (60 Hz / 300…500HP)

Note: cabinet and fan are not supplied by Schaffner.

October 2014
1/24

Important user notice

Schaffner ECOsine® harmonic filters are designed for the operation on the input (grid) side of power electronic equipment with 6-pulse rectifier front ends in balanced three-phase power systems, like typically used in AC or DC motor drives and high power DC supplies. Filter suitability for a given application must be determined by the user (the party that is putting the filter into operation) on a case by case basis. Schaffner will not assume liability for any consequential downtimes or damages resulting from use or application of ECOsine® filters outside of their specifications.

Important safety notes

	Filter installation, start-up, operation and maintenance has to be carried out by a trained and certified electrician or technician, who is familiar with safety procedures in electrical systems.
	High voltage potentials are involved in the operation of this product. Always remove power before handling energized parts of the filter, and let ample time elapse for the capacitors to discharge to safe levels (<42V). Residual voltages are to be measured both line to line and line to earth.
	Always connect the filter to protective earth (PE) first, then continue with the wiring of phase terminals. When decommissioning the filter, remove the PE connection at the end.
	Follow the installation notes closely. Ensure sufficient forced cooling as outlined in this documentation. Operate the filter within its electrical, mechanical, thermal and ambient specifications at all times.
	Passive harmonic filters are lossy electrical components. Filter surfaces and terminals may get hot under full load operating conditions.
	Always practice the safety procedures defined by your company and by applicable national electric codes when handling, installing, operating or maintaining electrical equipment.
	Do not operate ECOsine® filters on unsymmetrical loads, on linear loads, or with single-phase equipment.
	Always use an upstream disconnect or protection device as required by most national and international electric codes and safety standards.
	Follow the Schaffner instructions closely when doing maintenance work. Use exclusively spare parts recommmended and approved by Schaffner.
	In case of uncertainty and questions please don’t hesitate to contact your local authorized Schaffner partner or Schaffner sales office for assistance.

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1. Part number coding

FN 341x-xxx-xx-x-x

Functional options (for packaging option "E" only):

0 = none

T = trap disconnect

Packaging options:

E = Enclosed filter IP20 or IP54; bottom cable entry

O = open panel filter modules

C = component kit L & C

Input/output connection style:

99 = copper bus bar terminals

Typical unfiltered drive input current [A_{rms}]

Filter family

3410 = filter for 50Hz, 380-500V grids, diode rectifiers

3411 = filter for 50Hz, 380-500V grids, SCR rectifiers

3412 = filter for 60Hz, 380-480V grids, diode rectifiers

3413 = filter for 60Hz, 380-480V grids, SCR rectifiers

Schaffner standard filter range

Note: this document only refers to open panel filter modules. Options in grey color (above) are not available for this product version.

2. Scope of delivery

Filter	P	F	Rectif.	Chokes module	Capacitor modules		Damper module	Installation manual
					Modules	Caps		
FN 3410-380-99-O	200kW	50Hz	Diode	1	2	5	1	✓
FN 3410-470-99-O	250kW	50Hz	Diode	1	2	6	1	✓
FN 3410-580-99-O	315kW	50Hz	Diode	1	2	8	1	✓
FN 3410-650-99-O	355kW	50Hz	Diode	1	3	9	1	✓
FN 3410-710-99-O	400kW	50Hz	Diode	1	3	10	1	✓
FN 3411-380-99-O	200kW	50Hz	SCR	1	2	5	-	✓
FN 3411-470-99-O	250kW	50Hz	SCR	1	2	6	-	✓
FN 3411-580-99-O	315kW	50Hz	SCR	1	2	8	-	✓
FN 3411-650-99-O	355kW	50Hz	SCR	1	3	9	-	✓
FN 3411-710-99-O	400kW	50Hz	SCR	1	3	10	-	✓
FN 3412-380-99-O	300HP	60Hz	Diode	1	1	4	1	✓
FN 3412-440-99-O	350HP	60Hz	Diode	1	2	5	1	✓
FN 3412-490-99-O	400HP	60Hz	Diode	1	2	5	1	✓
FN 3412-540-99-O	450HP	60Hz	Diode	1	2	6	1	✓
FN 3412-590-99-O	500HP	60Hz	Diode	1	2	7	1	✓
FN 3413-380-99-O	300HP	60Hz	SCR	1	1	4	-	✓
FN 3413-440-99-O	350HP	60Hz	SCR	1	2	5	-	✓
FN 3413-490-99-O	400HP	60Hz	SCR	1	2	5	-	✓
FN 3413-540-99-O	450HP	60Hz	SCR	1	2	6	-	✓
FN 3413-590-99-O	500HP	60Hz	SCR	1	2	7	-	✓

Note: wiring material is not included in the scope of delivery.

3. Filter specifications

3.1 General electrical specifications FN3410 and FN3411 (50Hz filters)

Nominal operating voltage:	3x 380 to 500VAC
Voltage tolerance range:	3x 342 to 550VAC
Operating frequency:	50Hz ±1Hz
Network:	TN, TT, IT
Nominal motor drive input current rating*:	380 to 710A @ 40°C
Nominal filter input current rating*:	305 to 600A_{rms} @ 40°C
Nominal motor drive input power rating:	200 to 400kW
Total harmonic current distortion THID**:	~5% @ rated power with L_{dc}
	<15% @ de-rated power without L_{dc}
Total demand distortion TDD**:	According to IEEE 519, table 10-3
Partially weighted harmonic distortion PWHID:	≤15% @ rated power
Efficiency:	≥99% @ nominal line voltage and power
Drive dc-link voltage behavior***:	No load: +5%
	Full load: -3%
High potential test voltage****:	P → E 2500VAC (1min)
SCCR*****:	100kA
Protection category:	IP00
Cooling:	Forced air, to be provided by the installer/integrator
Overload capability:	1.6x rated current for 1 minute, once per hour
Capacitive current at low load:	≤22% of rated input current, at 400VAC
	≤28% of rated input current, at 500VAC
Ambient temperature range:	-25°C to +40°C fully operational
	+40°C to +60°C de-rated operation******
	-25°C to +85°C transportation and storage
Flammability class:	UL 94V-2 or better
Insulation class of magnetic components:	H (180°C)
Design corresponding to:	UL 508c, EN 61558-2-20, CE (LVD 2006/95/EC)
MTBF @ 40°C/500V (Mil-HB-217F):	>115,000 hours (higher with scheduled maintenance; chapter 7)
Lifetime (calculated):	Min. 10 years
Safety monitoring functions:	Over-temperature of magnetic components
Safety monitor output signal:	NC switch

* ECOsine® filters reduce RMS input and peak current by reducing harmonic currents and improving true power factor.
** System requirements: THVD <2%, line voltage unbalance <1%
Performance specification for diode rectifiers. SCR rectifier front-ends produce different results, depending upon the firing angle of the thyristors.
*** Conditions: line impedance <5%
**** Repetitive tests to be performed at max. 80% of above levels, for 2 seconds.
***** External UL-rated fuses required.
****** $I_{derated} = I_{nominal} * \sqrt{(85°C - T_{amb})/45°C}$

3.2 General electrical specifications FN3412 and FN3413 (60Hz filters)

Nominal operating voltage:	3x 380 to 480VAC
Voltage tolerance range:	3x 342 to 528VAC
Operating frequency:	60Hz ±1Hz
Network:	TN, TT, IT
Nominal motor drive input current rating*:	380 to 590A @ 40°C
Nominal filter input current rating*:	295 to 495A_{rms} @ 40°C
Nominal motor drive input power rating:	300 to 500HP
Total harmonic current distortion THID**:	~5% @ rated power with L_{dc}
	<15% @ de-rated power without L_{dc}
Total demand distortion TDD**:	According to IEEE 519, table 10-3
Partially weighted harmonic distortion PWHID:	≤15% @ rated power
Efficiency:	≥99% @ nominal line voltage and power
Drive dc-link voltage behavior***:	No load: +5%
	Full load: -3%
High potential test voltage****:	P → E 2500VAC (1min)
SCCR*****:	100kA
Protection category:	IP00
Cooling:	Forced air, to be provided by the installer/integrator
Overload capability:	1.6x rated current for 1 minute, once per hour
Capacitive current at low load:	<26% of rated input current, at 460VAC
Ambient temperature range:	-25°C to +40°C fully operational
	+40°C to +60°C de-rated operation******
	-25°C to +85°C transportation and storage
Flammability class:	UL 94V-2 or better
Insulation class of magnetic components:	H (180°C)
Design corresponding to:	UL 508c, EN 61558-2-20, CE (LVD 2006/95/EC)
MTBF @ 40°C/460V (Mil-HB-217F):	>115,000 hours (higher with scheduled maintenance; chapter 7)
Lifetime (calculated):	Min. 10 years
Safety monitoring functions:	Over-temperature of magnetic components
Safety monitor output signal:	NC switch

* ECOsine® filters reduce RMS input and peak current by reducing harmonic currents and improving true power factor.

** System requirements: THVD <2%, line voltage unbalance <1%
Performance specification for diode rectifiers. SCR rectifier front-ends produce different results, depending upon the firing angle of the thyristors.

*** Conditions: line impedance <5%

**** Repetitive tests to be performed at max. 80% of above levels, for 2 seconds.

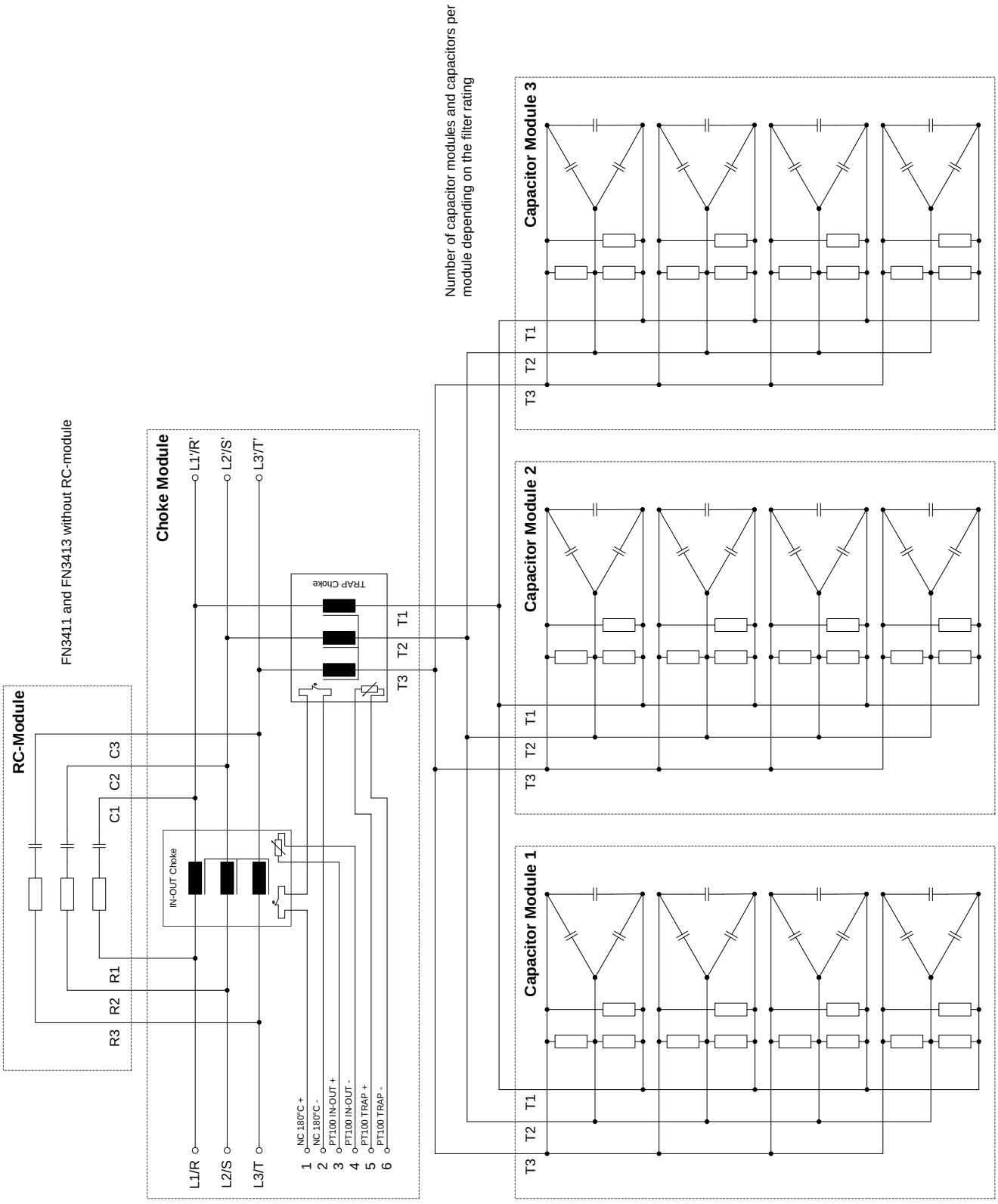
***** External UL-rated fuses required.

****** $I_{derated} = I_{nominal} * \sqrt{(85°C - T_{amb})/45°C}$

3.3 Additional specifications

For additional product specifications, selection tables and performance characteristics, please consult the published datasheet on the Schaffner webiste www.schaffner.com or ask your local authorized Schaffner partner.

4. Wiring diagram



5. Filter installation

Please follow the steps below to ensure a safe and satisfying filter function for many years.

5.1 Visual inspection

All Schaffner ECOsine® filters have undergone rigorous testing before they left our ISO9001:2008 certified factory. They are packaged with great care in a sturdy container for international shipment.

However, carefully inspect the shipping container for damage that may have occurred in transit. Then unpack the filter and carefully inspect for any signs of damage. Save the shipping container for future transportation of the filter.

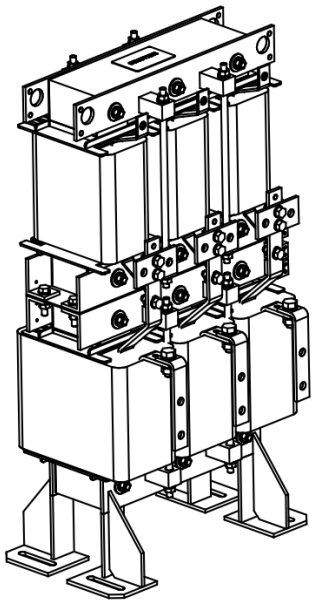
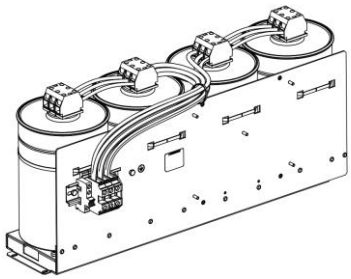
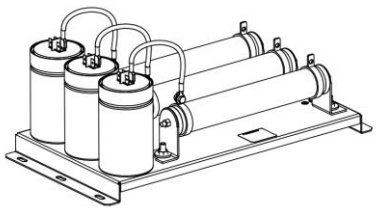
In the case of damage, please file a claim with the freight carrier involved immediately and contact your local Schaffner partner for support. Under no circumstances install and energize a filter with visible transportation damage.

If the filter is not going to be put in service upon receipt, store within the original container in a clean, dry location, free of dust and chemicals.

5.2 Mounting

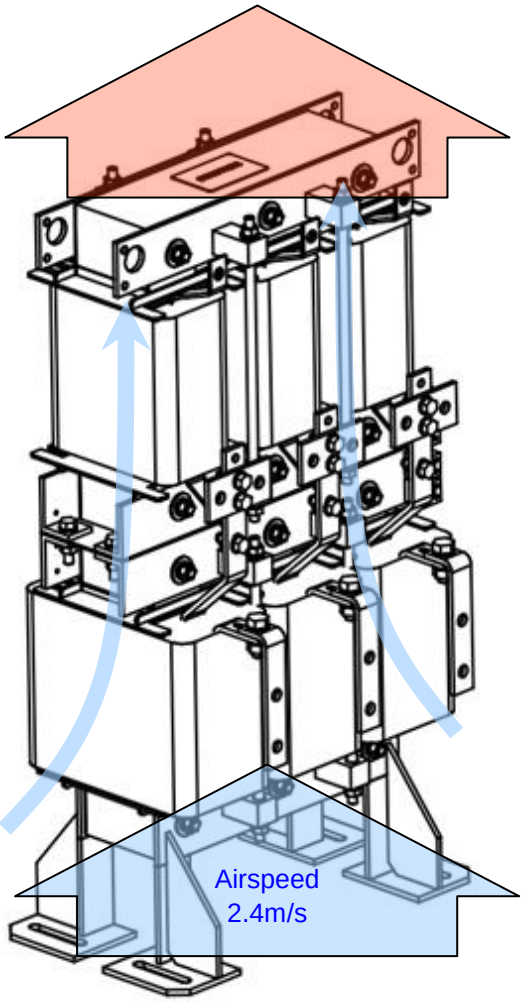
ECOsine® load-applied filters are best installed as close as possible to the non-linear load in question. Ideally they are mounted next to the rectifier or motor drive inside the electrical cabinet.

Please pay attention to the installation position:

Chokes module	**Capacitor modules**	**Damper module**
Upright floor mounting only 	Vertical mounting of capacitors preferred for maximum life time 	Vertical or horizontal mounting possible 

Important:

In order to ensure sufficient flow of warm air, keep a clearance of min. 150mm above the chokes module. Under all circumstances avoid the chokes module to be built into a tight space without the possibility of sufficient air flow!



Space requirements:

Top of chokes: >150mm from iron core

Sides and back: >100mm from coils

Front: keep free to install power cables

Airflow requirement:

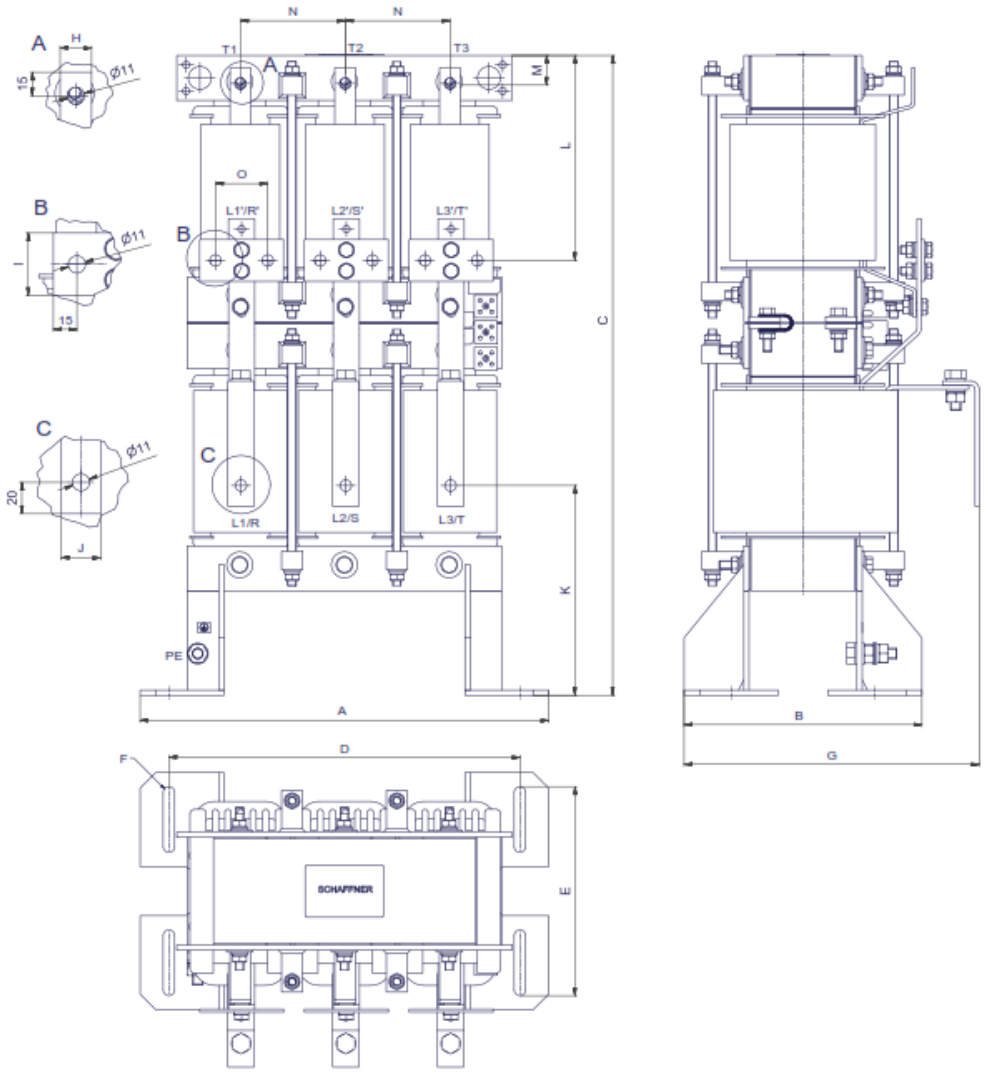
It must be ensured that the environmental temperature is kept below 40°C with appropriate forced cooling. Filter operation in warmer environments require a temperature de-rating.

Filter rating		**Air speed**	**Air volume**
200kW	300HP	2.4m/s	550m^3/h
250kW	350HP	2.4m/s	550m^3/h
315kW	400HP	2.4m/s	550m^3/h
355kW	450HP	2.4m/s	700m^3/h
400kW	500HP	2.4m/s	700m^3/h

The air can either be pushed from the bottom or pulled from the top.

Note: consider the use of air deflectors to ensure the proper air flow direction as recommended above, depending upon the overall concept and layout of the cabinet.

5.2.1 Chokes module:



	200kW	250kW	315kW	355kW	400kW	300HP	350HP	400HP	450HP	500HP
A	390 ±1	390 ±1	390 ±1	590 ±1	590 ±1	390 ±1	390 ±1	390 ±1	590 ±1	590 ±1
B	227 ±2	212 ±2	227 ±2	248 ±2	268 ±2	227 ±2	212 ±2	227 ±2	238 ±2	258 ±2
C	< 620	< 725	< 725	< 750	< 750	< 620	< 725	< 725	< 750	< 750
D	335 ±1	335 ±1	335 ±1	535 ±1	535 ±1	335 ±1	335 ±1	335 ±1	535 ±1	535 ±1
E	175	175	175	200	200	175	175	175	200	200
F	M10 +1	M10 +1	M10 +1	M10 +1	M10 +1	M10 +1	M10 +1	M10 +1	M10 +1	M10 +1
G	< 300	< 300	< 300	< 300	< 300	< 300	< 300	< 300	< 300	< 300
H	20	20	20	20	20	20	20	20	20	20
I	40	40	40	40	40	40	40	40	40	40
J	25	25	25	25	30	25	25	25	25	30
K	200 ±5	240 ±5	240 ±5	290 ±5	290 ±5	200 ±5	240 ±5	240 ±5	290 ±5	290 ±5
L	195 ±5	240 ±5	240 ±5	200 ±5	210 ±5	195 ±5	240 ±5	240 ±5	210 ±5	210 ±5
M	25 ±3	35 ±3	35 ±3	35 ±3	35 ±3	25 ±3	35 ±3	35 ±3	35 ±3	35 ±3
N	100	120	120	140	140	100	120	120	140	140
O	50	50	50	70	80	50	50	50	70	70
Weight	~120kg	~135kg	~160kg	~215kg	~250kg	~120kg	~135kg	~150kg	~195kg	~235kg

All dimensions in mm; 1 inch = 25.4mm

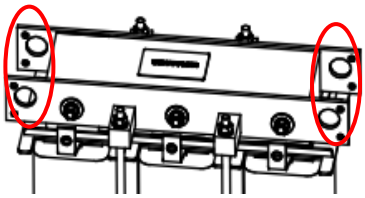
Tolerances according: ISO 2768-m / EN 22768-m

It is recommended to bolt the chokes module permanently to the cabinet floor. The mounting hole pattern fits standard Rittal cabinets' mounting brackets.

Drilling hole pattern: please consult the mechanical drawing on the previous page.

Caution: the chokes module is very heavy. Make sure to use proper lifting equipment, using the 4 lifting eyes provided at the top of the chokes module.

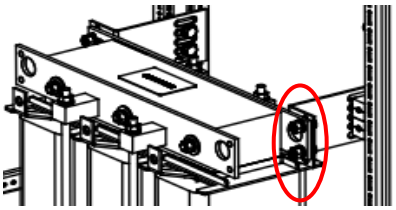
Align the chokes module with the mounting holes in the cabinet floor and bolt it down tightly with appropriate threaded bolts.



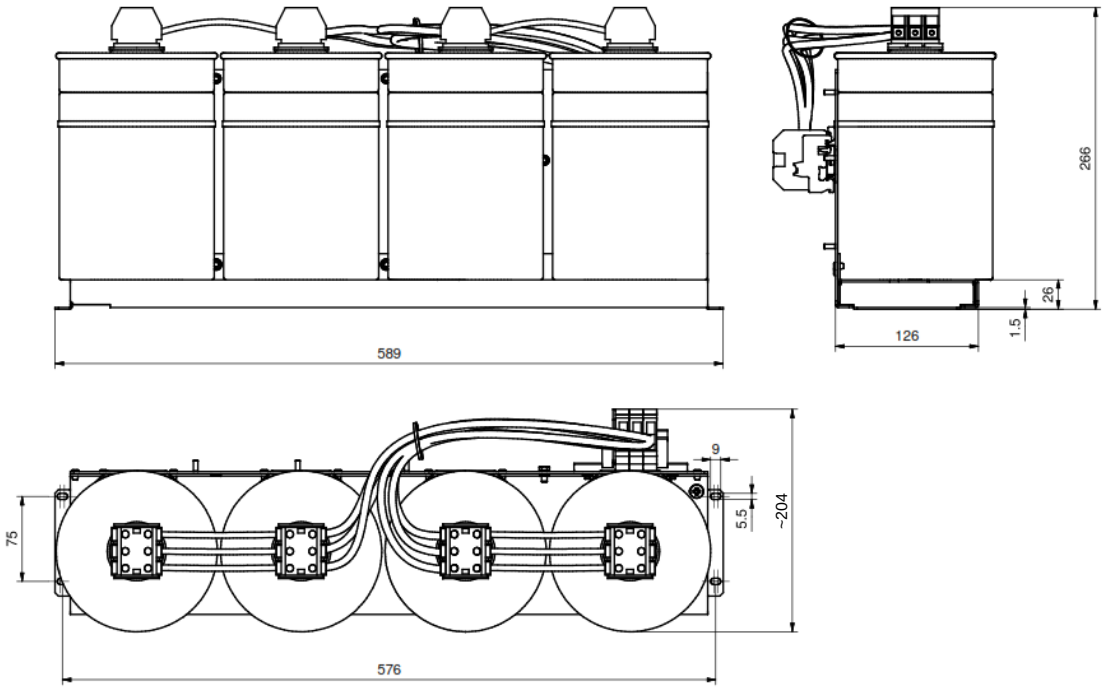
Optional top side mounting bracket:

The choke module is relatively high compared to its footprint. If vibrations, bumps or mechanical oscillation of the cabinet are expected, it is recommended to permanently fix the top of the choke. For that purpose, holes are available next to the lifting eyes.

Note: top side mounting brackets are not included in the scope of delivery.



5.2.2 Capacitor modules:



All dimensions in mm; 1 inch = 25.4mm
Tolerances according: ISO 2768-m / EN 22768-m

The capacitor modules are designed for standard 600mm deep Rittal cabinets with mounting brackets.

First, attach the mounting rail of the capacitor module to the mounting brackets of the cabinet with 4 threaded bolts. Then, slide the capacitor module onto the mounting rail.

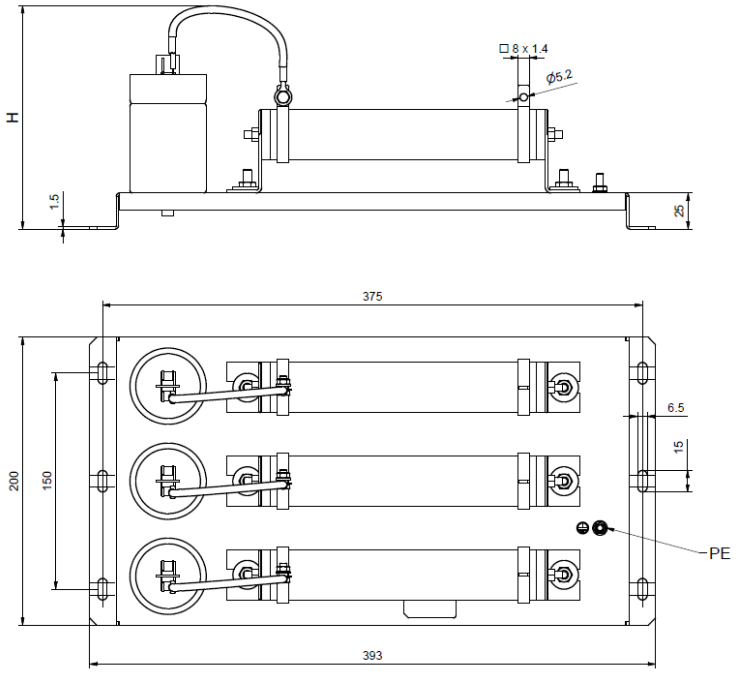
Attention: make sure to place the locking screw towards the cabinet door.

Next, tighten the locking screw to hold the capacitor module safely in place.

Repeat the above steps for all capacitor modules.

Note: the number of modules and number of capacitors per module depend on the filter type.

5.2.3 RC damper module:



Filters 50Hz	H
FN341x-380-99-O	< 145
FN341x-470-99-O	< 145
FN341x-580-99-O	< 145
FN341x-650-99-O	< 160
FN341x-710-99-O	< 160
Filters 60Hz	**H**
FN341x-380-99-O	< 145
FN341x-440-99-O	< 145
FN341x-490-99-O	< 145
FN341x-540-99-O	< 160
FN341x-590-99-O	< 160

All dimensions in mm; 1 inch = 25.4mm
Tolerances according: ISO 2768-m / EN 22768-m

The damper module can be installed either horizontally or vertically.

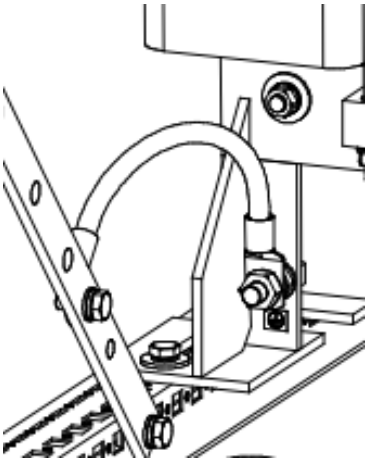
Drilling hole pattern: please consult the mechanical drawing above.

5.3 Wiring

5.3.1 Verify safe disconnection of all line side power

Consult your local safety instructions and the important safety notes at the beginning of this document.

5.3.2 Connect protective earth (PE) wires to adequate earth potential close to all ECOsine® filter modules.



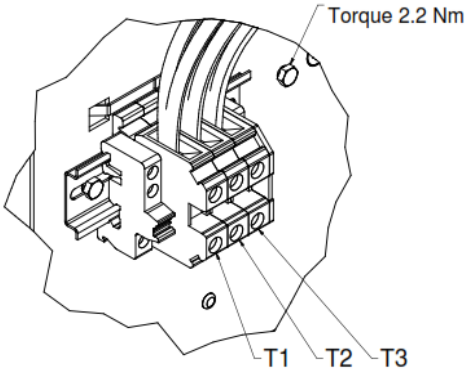
Use a PE wire diameter according to your local electrical code and safety instructions.

PE bolt M10

Torque PE: 15 – 17Nm

5.3.3 Connect the capacitor modules to the choke module

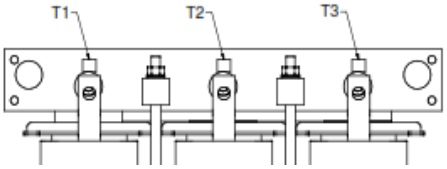
1. Connect the PE wire to the capacitor modules (M5x10mm PE stud provided).
2. Connect the capacitor modules' terminals (3x) to the choke module terminals T1, T2, T3



Max. wire size AWG 0/1 / 35mm²
Torque: 3.2 – 3.7Nm

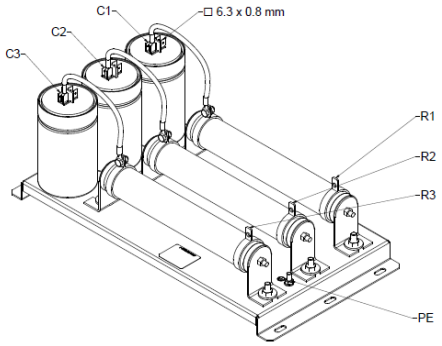
Please refer to the recommendations below for proper wiring (per module):

Filter rating	Capacitor connections (T1…T3)		
	Wire size max.	**Capacitor side**	**Choke terminal**
All ratings	35mm² / AWG 0/1	Stranded wire, stripped 16mm Torque: 3.2 – 3.7Nm	Ring lug M10



Note: wiring material is not included in the scope of delivery.

5.3.4 Connect the RC damper module to the choke module



1. Connect the PE wire to the RC damper module (M5x15mm PE stud torque: 2.2Nm).
2. Connect the capacitors (C1…C3) to the choke terminals L1'/R', L2'/S', L3'/T'.
3. Connect the resistors (R1…R3) to the choke terminals L1/R, L2/S, L3/T.

Please refer to the recommendations below for proper wiring:

Filter rating	Capacitor connections (C1…C3)			Resistor connections (R1…R3)		
	Wire size	Capacitor side	Choke side	Wire size	Resistor side	Choke side
All ratings	2.5mm^2 / AWG10	AMP fast-on 6.3x0.8mm	Ring lug M5	2.5mm^2 / AWG10	Ring lug M5	Ring lug M5

Note: wiring material is not included in the scope of delivery.

5.3.5 Verify correct filter wiring

Next, please verify the following values with a commonly available LCR meter.

Filter designation	Capacitance [uF] T1-T2, T2-T3, T1-T3			Capacitance [uF] C1-R1, C2-R2, C3-R3		
	Min	Nom	Max	Min	Nom	Max
FN3410-380-99-O	387.6	408.0	448.8	19	20	21
FN3410-470-99-O	465.1	489.6	538.6	19	20	21
FN3410-580-99-O	620.2	652.8	718.1	19	20	21
FN3410-650-99-O	697.7	734.4	807.8	38	40	42
FN3410-710-99-O	775.2	816.0	897.6	38	40	42
FN3411-380-99-O	387.6	408.0	448.8	-	-	-
FN3411-470-99-O	465.1	489.6	538.6	-	-	-
FN3411-580-99-O	620.2	652.8	718.1	-	-	-
FN3411-650-99-O	697.7	734.4	807.8	-	-	-
FN3411-710-99-O	775.2	816.0	897.6	-	-	-
FN3412-380-99-O	310.1	326.4	359.0	19	20	21
FN3412-440-99-O	387.6	408.0	448.8	19	20	21
FN3412-490-99-O	387.6	408.0	448.8	19	20	21
FN3412-540-99-O	465.1	489.6	538.6	38	40	42
FN3412-590-99-O	542.6	571.2	628.3	38	40	42
FN3413-380-99-O	310.1	326.4	359.0	-	-	-
FN3413-440-99-O	387.6	408.0	448.8	-	-	-
FN3413-490-99-O	387.6	408.0	448.8	-	-	-
FN3413-540-99-O	465.1	489.6	538.6	-	-	-

	FN3413-590-99-O	542.6	571.2	628.3	-	-	-

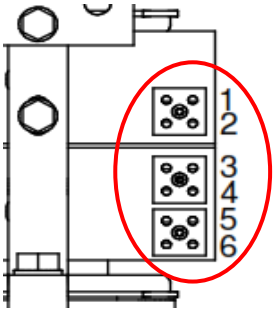
5.3.6 Connect over-temperature switch (terminals 1 and 2)

The over-temperature switch is a potential-free bi-metal contact, which is normally closed (NC). It may either be used to remotely disconnect the drive's load via respective input of drive control (consult motor drive manual) or as alarm sensor for a system control unit.

Ratings:

Contact type:	NC
Nominal switching temperature:	180°C
Standard tolerance:	+/- 5%
Rated voltage:	250VAC (50-60Hz)
Rated current:	10A at cos phi = 1.0
	6.3A at cos phi = 0.6

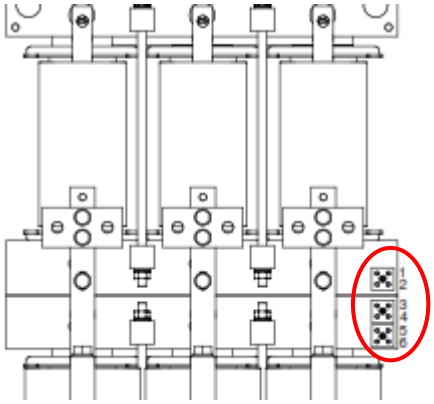
An engaged over-temperature switch must immediately lead to load shutdown and investigation of the problem!



5.3.7 Additional thermal monitoring sensors (terminals 3…6)

Both chokes are equipped with a temperature sensor connected to the terminal blocks indicated with 3…6. They can be optionally utilized if desired. The specifications can be found on the website of the supplier.

Sonsor manufacturer:	Philips Semiconductor
Sensor type:	KTY83/120



5.3.8 Connect ECOsine® load side terminals L1'/R', L2'/S', L3'/T'

to respective motor drive or rectifier inputs.

Please consult the table to the right for recommended wire sizes and torques.

The final selection should be made according to local regulations, cable installation and cable specification.

Recommendation: use stranded copper wire with a temperature rating of 90°C or higher.

Filter	Rec. wire size per phase	Lug	Rec. torque
200kW	2x 95mm2	M10	25Nm
250kW	2x 120mm2	M10	25Nm
315kW	2x 150mm2	M10	25Nm
355kW	2x 185mm2	M10	25Nm
400kW	2x 240mm2	M10	25Nm
300HP	2x 95mm2	M10	25Nm
350HP	2x 120mm2	M10	25Nm
400HP	2x 150mm2	M10	25Nm
450HP	2x 185mm2	M10	25Nm
500HP	2x 240mm2	M10	25Nm

5.3.9 Connect ECOsine® line side terminals L1/R, L2/S, L3/T

to power input protection (current limiting fuses – see below).

Use the same wire type and cross section as outlined under 5.3.8 for load side wiring.

5.3.10 Fuses

ECOsine® filters need external over-current protection for compliance with UL/cUL standard. Fuses and associated fuseholders must be UL listed and rated for 100kA SCCR supplies.

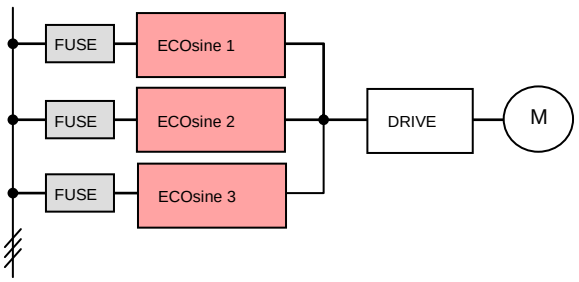
Always refer to the installation manual of the motor drive to be equipped with the filter for fuse and circuit breaker selection purposes. The following table indicates required fuse current ratings to comply with UL standards.

IEC: gG type fuses or equivalent
UL: UL class J, class L fuses

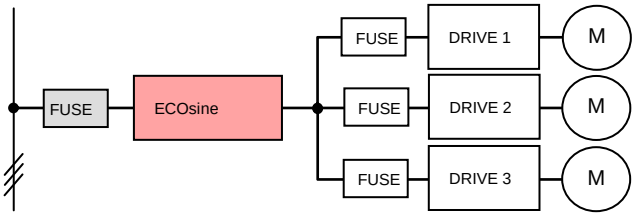
60Hz filters	VAC [V_{rms}]	Quick acting fuse Rated amps [A]
300HP	460	400
350HP	460	600
400HP	460	600
450HP	460	600
500HP	460	800

50Hz filters	VAC [V_{rms}]	Quick acting fuse Rated amps [A]
200kW	400	400
	500	400
250kW	400	600
	500	600
315kW	400	800
	500	800
355kW	400	800
	500	800
400kW	400	800
	500	800

A system with multiple ECOsine® filters in parallel for a high power load need each a separate 3-phase line side fuse block, corresponding to the respective filter and according to the above table.
The drive's user manual may prescribe line-side fuse protection as well, which in this case either corresponds to the sum of the filter fuse ratings or, if lower, would request separate drive fuses at its input.



An application, having one ECOsine® filtering harmonics of several drives, requires in any case line side fuse protection of the drives as well as the correct filter protection according to above table.



6. Installation example

The following illustration presents a possible way of installing the filter modules in a standard cabinet.

Note: an air deflector as shown at the bottom in front of the chokes module can help to guide the cooling air stream through the cooling channels of the magnetic components.

Note: cabinet, fan, air deflector and wiring are not supplied by Schaffner.

7. Filter maintenance

The passive harmonic filters described in this manual are equipped with long life components that ensure a satisfactory function for many years under normal operating conditions. Any operation under extreme conditions such as over-temperatures, overvoltage situations, polluted environments etc. reduces the life expectancy. Following maintenance recommendation will help maximizing their life.

High voltage potentials are involved in the operation of this product. Always remove line side power before attempting to perform maintenance, and let ample time elapse for the capacitors to discharge to safe levels (<42V). Residual voltages are to be measured both line to line and line to earth.

7.1 Maintenance schedule

Year	1	2	3	4	5	6	7	8	9	10	11	12
Check and clean fan & air filter *	X	X	X	X	X	X	X	X	X	X	X	X
Replace fan & air filter *					X					X		
Check & tighten el. connections	X	X	X	X	X	X	X	X	X	X	X	X
Check values of power capacitors		X		X		X		X		X		X
Replace power capacitors										X		

* Fans and airs filter are not supplied by Schaffner. Please also consult the recommendations of the fan supplier for maintenance and replacement schedules.

7.2 Fan and air filter

Forced cooling devices are needed for the operation of Schaffner ECOsine® filters up to their nominal rating. Such cooling devices must be checked and cleaned regularly along with their air filters (if installed) to ensure sufficient air flow at all times.

Note: increased audible noise is a typical indicator of a fan that needs maintenance or replacement also outside of a maintenance schedule.

Note: a clogged air filter can greatly inhibit air circulation even with a brand new and powerful fan.

Before cleaning or replacing the cooling devices, make sure to consult the recommended maintenance procedures and schedules of the supplier of the cooling device in use.

7.3 Power capacitors

The power capacitors supplied with the filter modules are high quality components with an expected life time of up to 100’000 hours (11 years). Nevertheless, their useful service life can be shortened by electrical or thermal stress beyond their specification.

Power capacitor damage may also be caused by severe abnormal supply voltage peaks (i.e. lightning – depending upon system protection), but may only be recognizable through the measurement of line side harmonics distortion. This may be checked with a modern energy meter or by regular checkup with a power quality analyzer. According to the above considerations, a 2 year inspection interval is advisable.

Note: an inspection should as well be performed after extreme overvoltage situations in the system.

7.4 Electrical connections

Depending upon the environemt and application, electrical connections, in particular threaded bolts and nuts, can degrade over time by means of losing their initial tightening torque. This holds true not only for the filter, but for any such joint within an electrical installation.

Therefore, Schaffner recommends to check and tighten all electrical connections on the occasion of a regular scheduled maintenance of the entire device that incorporates the filter.

Note: make sure to check all electrical connections, also e.g. the factory wired terminals of the three phase capacitors (tightenig torque: 1.2Nm) and the PE terminals.

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